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Fertilizer and Pesticide Management in Canada

2004, Vol. 1, No. 3

by Maurice Korol

Agriculture and Agri-Food Canada

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
X	suppressed to meet confidentiality requirements of the Statistics Act
^{A}	excellent
^{B}	very good
^{C}	good
^{D}	acceptable
^{E}	use with caution
F	too unreliable to be published

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Fertilizer and Pesticide Management in Canada

Fertilizer and Pesticide Management in Canada presents information on the various practices used to manage chemical inputs, specifically chemical fertilizers and pesticides, on Canadian farms. The analysis contained in this article is based on results from the 2001 Farm Environmental Management Survey (FEMS).

Canadian farmers are actively involved in environmental initiatives and are adopting farming practices that minimize pollution risks to air, water and soil, while contributing to the conservation of biodiversity. FEMS results provide useful information for measuring the adoption of environmentally sound practices and for assisting governments, farmers and non-governmental organizations in the promotion and development of new farm environmental programs and practices. FEMS results show that there are differences between provinces with respect to chemical input management practices as a result of different production practices, climate and commodities.

Note to readers

Readers should be aware that FEMS data alone, though providing a wealth of information, are insufficient to assess environmental risks. The FEMS data are meant to provide an overall picture of various farming practices that may have an impact on the environment. To have a full appreciation of farmers' adoption of environmental management practices and of their impacts (positive or negative) on the environment, additional information and more comprehensive analysis is required. Thus, readers are advised to use caution when interpreting these data.

A previous survey, the 1995 Farm Input Management Survey (FIMS), collected similar information on manure management in Canada. However, FIMS and FEMS data cannot be readily compared because of differences in survey design, sample size and questions asked.

Highlights

The 2001 FEMS data show that, nationally:

- Three-quarters of Canadian farmers who grow crops use fertilizers, with about 90% of the fertilizer applied in the spring.
- Half of Canadian farmers use soil test results to determine the amount of fertilizer required, but less than 20% do so annually.
- About half of Quebec farmers have a nutrient management plan. This percentage is much higher than in other provinces.
- Almost three-quarters of Canadian farmers who grow crops and have pasture apply pesticides.
- With respect to alternate pest control methods, two-thirds of Canadian farmers report using mechanical weeding methods, while less than 4% use biological methods of controlling pests.

1. Introduction

Fertilizer and Pesticide Management in Canada is the third article in a series of studies collectively called *Farm Environmental Management in Canada*. The objective of this series is to publish the key results of the 2001 Farm Environmental Management Survey (FEMS).[1] The series presents information about the farming practices used on Canadian farms as they relate to a number of agri-environmental topics such as manure handling, water management, chemical inputs and sustainable land management practices.

Agricultural activities by their very nature have a significant impact on the environment. Tillage practices alter natural landscapes, agricultural inputs enter ecosystems and animal by-products influence ecological balances. Because of environmental concerns, Canadian farmers are at the frontlines as stewards of the environment. Farmers are actively involved in environmental programs and are adopting farming practices that minimize pollution risks to air, water and soil, while contributing to the conservation of bio-diversity. The FEMS results provide useful information for measuring the adoption of environmentally sound practices and assisting governments, farmers and non-governmental organizations in the promotion and development of farm environmental initiatives.

Fertilizer and Pesticide Management in Canada provides information on the key management practices that were used by Canadian farmers in 2001. To assess the importance of these practices, the number of farms provides valuable information on the extent to which the farm community is aware of and has adopted farming practices that are more environmentally sound. Although the focus of this analysis is mainly at the national level, some highlights are also presented on a provincial basis.

The topics covered comprise most of the key characteristics of fertilizer and pesticide management.[2] Topics include seasonal crop residue management, chemical fertilizer use and application, soil testing, nutrient management and implementation of nutrient management plans and pesticide management practices.

1. FEMS was conducted in March 2002 by Statistics Canada for Agriculture and Agri-Food Canada. The survey provides a broad coverage of farm management practices that are related to the environment in all sectors of Canadian agriculture.

2. The two previous articles in this series, *Manure Storage in Canada* and *Manure Management in Canada*, address issues related specifically to manure storage systems and manure management practices. Readers can find these articles on Statistics Canada's web site at http://www.statcan.ca/english/freepub/21-021-MIE/free.htm

2. Chemical input use and the environment

Canadians are concerned about the impacts that farm practices can have on the environment and on human health. These farm practices involve the use of inputs such as fossil fuels, fertilizers, and pesticides. The use and management of these farm inputs have an impact on the sustainability of agricultural production and on the environment. Effective use of farm inputs can help improve sustainability by minimizing environmental risks and can enhance farm profitability through more efficient utilization of costly inputs. While cost is a factor that farmers always seek to minimize, the mix or combinations of the inputs used by farmers are determined not only by economic considerations, but also by technological advances. For example, according to the last Census of Agriculture, there has been a large increase in minimum or no-till practices. This is the result of developments in new equipment and pesticides, coupled with the realization that reduced or no-till is a sound agronomic practice in the right conditions. This practice can result in reduced soil erosion and reduced oxidation of soil carbon. Conversely, water quality, soil quality and biodiversity can be adversely affected by the improper use of plant nutrient and pest controls. The proper management of farm inputs is further complicated by the great regional diversity in agronomic conditions across Canada.

Farm inputs management is one of the key factors that affect agroecosystem sustainability. One of the strategies used by farm operators to optimize the use of farm inputs and manage environmental risks is the application of beneficial management practices (BMPs). There are a wide variety of definitions of BMPs because of the different ecological and agronomic conditions from region to region. However, they all encompass a similar objective: managing production systems to achieve environmental goals while maintaining acceptable levels of economic returns. Examples of BMPs for farm inputs include regular soil testing, integrated pest management (IPM) and manure runoff containment. BMPs vary from farm to farm according to the physical, financial and technological components unique to each operation.

Fertilizer and pesticide use have been commonplace in Canadian agriculture for many years. In comparison to the high input production practices in the United States and some European countries, Canadian agriculture uses less of these inputs on a per-hectare basis. The relatively short and cool growing season limits the extent of insect and fungus problems relative to many other countries. Moreover, much of the crop and grazing lands are situated in Western Canada where the low level of precipitation limits crop yield. As a result of this, only relatively low levels of fertilizer applications are economically viable. In Central and Atlantic Canada, in contrast, a longer growing season and higher precipitation produce conditions that allow for greater use of farm inputs on crops that are higher yielding. This is particularly the case in southern Ontario, where high levels of fertilization and pesticides use are observed.

3. Crop production

Canada is one of the largest countries in the world in terms of land area but only a relatively small portion of the land mass is suited for agricultural production. According to the latest Census of Agriculture (2001), 41 million hectares of land was utilized in the production of field crops. Table 1 indicates the distribution of the major crops grown by area in Canada, as well as their value.

Table 1: Field crops, Canada, 2001

	Area (hectares)	Share of area (%)	Value ($)
Wheat	10,860,220	26.6	3,446,028
Tame hay and seeded pasture	4,804,496	11.7	.
Barley	4,696,808	11.4	729,108
Canola	3,782,906	9.2	1,718,264
Oats	1,890,131	4.6	294,230
Corn	1,299,506	3.2	621,824
Soybeans	1,082,547	2.6	531,512
Vegetables	133,851	0.3	1,349,097
Floriculture and nursery	127,380	0.3	1,698,427
Other	12,521,803	30.4	.
Total	**41,199,648**	**100**	.

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, Census of Agriculture 2001.

According to the FEMS, almost 90% of the 193,180 Canadian farms included in this survey[3] grow crops or have pasture (Table 2). Saskatchewan has the largest number of farms that raise crops, followed closely by Ontario. In addition, both provinces report the largest percentage of farms involved in crop production, at 94.7% and 92.2% respectively. Newfoundland and Labrador, British Columbia, and New Brunswick have the lowest percentage of farms growing crops, at around 80%.

3. The total number of farms is lower in the FEMS than that reported in the Census of Agriculture because the FEMS included only those with total gross farm receipts of $10,000 or more.

Table 2: Farms growing crops, Canada and provinces, 2001

	Yes		No		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	240 [B]	80.0	60 [B]	20.0	300	100
Prince Edward Island	1,240 [A]	89.2	145 [A]	10.4	1,390	100
Nova Scotia	1,945 [A]	86.1	315 [A]	13.9	2,260	100
New Brunswick	1,590 [B]	81.1	370 [B]	18.9	1,960	100
Quebec	23,250 [A]	85.1	4,055 [A]	14.9	27,305	100
Ontario	41,585 [A]	92.2	3,530 [A]	7.8	45,115	100
Manitoba	14,735 [A]	87.7	2,070 [A]	12.3	16,805	100
Saskatchewan	42,860 [A]	94.7	2,375 [A]	5.3	45,235	100
Alberta	37,330 [A]	86.1	6,045 [A]	13.9	43,380	100
British Columbia	7,630 [A]	80.9	1,795 [A]	19.0	9,430	100
Canada	**172,415** [A]	**89.3**	**20,770** [A]	**10.8**	**193,180**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

4. Crop residue management

The management of crop residue is important because of its implications on soil moisture conservation in the short run, and on soil organic matter content over the longer term. In addition, residue or trash cover halts or reduces the damage caused by water and wind erosion. Across Canada, respondents indicated two principal methods of crop residue management. Chopping and spreading straw in the field and bailing straw together accounted for over 80% of all methods reported (Table 3). The "chop and spread straw" method was more popular in the Prairies than in other provinces. Burning straw constitutes only 2.2% of all crop residue management methods across Canada. However, burning straw was more popular in Manitoba where it represented over 8% of all methods. Manitoba's result is higher than the other Prairie Provinces because the wetter conditions that prevail in that region tend to produce taller crops and, consequently, more crop residue per acre. This crop residue has traditionally been disposed of by burning.

Table 3: Management of crop residues, Canada and provinces, 2001

	Chop and spread straw	Bale straw	Burn straw	Other	Not applicable	Total
	Number of methods					
Newfoundland and Labrador	50 [C]	X	X	0.0	190 [C]	240
Prince Edward Island	250 [A]	X	X	X	200 [A]	1,330
Nova Scotia	290 [A]	575 [B]	X	X	1,070 [B]	2,015
New Brunswick	395 [B]	690 [B]	X	X	580 [B]	1,700
Quebec	6,420 [A]	12,495 [A]	85 [A]	405 [A]	5,700 [A]	25,095
Ontario	17,240 [A]	20,570 [A]	280 [A]	1,180 [A]	7,480 [A]	46,755
Manitoba	9,045 [A]	7,825 [A]	1,670 [A]	245 [A]	1,280 [A]	20,070
Saskatchewan	34,755 [A]	18,585 [A]	2,180 [A]	580 [A]	1,230 [A]	57,345
Alberta	17,620 [A]	21,575 [A]	95 [A]	1,490 [A]	5,245 [A]	46,030
British Columbia	1,580 [A]	980 [A]	140 [A]	200 [A]	4,975 [A]	7,880
Canada	**87,640** [A]	**84,160** [A]	**4,530** [A]	**4,190** [A]	**27,945** [A]	**208,455**
	Share of methods (%)					
Newfoundland and Labrador	20.8	X	X	0.0	79.2	100
Prince Edward Island	18.8	X	X	X	15.0	100
Nova Scotia	14.4	28.5	X	X	53.1	100
New Brunswick	23.2	40.6	X	X	34.1	100
Quebec	25.6	49.8	0.3	1.6	22.7	100
Ontario	36.9	44.0	0.6	2.5	16.0	100
Manitoba	45.1	39.0	8.3	1.2	6.4	100
Saskatchewan	60.6	32.4	3.8	1.0	2.1	100
Alberta	38.3	46.9	0.2	3.2	11.4	100
British Columbia	20.1	12.4	1.8	2.5	63.1	100
Canada	**42.0**	**40.4**	**2.2**	**2.0**	**13.4**	**100**

Notes: *1.* An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

5. Commercial fertilizer management

Producers were asked if they applied fertilizer to the land. About three-quarters of the farms nation-wide indicated that they used fertilizer in 2001 (Table 4). Prince Edward Island and Ontario reported the highest percentage of farms that apply commercial fertilizer.

Table 4: Application of commercial fertilizer, Canada and provinces, 2001

	Yes		No		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	170 [C]	70.8	70 [C]	29.2	240	100
Prince Edward Island	1,050 [B]	84.7	185 [A]	14.9	1,235	100
Nova Scotia	1,470 [B]	75.8	470 [B]	24.2	1,940	100
New Brunswick	1,095 [B]	68.9	500 [B]	31.4	1,590	100
Quebec	16,545 [A]	71.3	6,665 [A]	28.7	23,215	100
Ontario	33,640 [A]	81.3	7,755 [A]	18.7	41,395	100
Manitoba	10,805 [A]	77.6	3,120 [A]	22.4	13,925	100
Saskatchewan	31,980 [A]	75.3	10,520 [A]	24.8	42,495	100
Alberta	25,615 [A]	69.3	11,360 [A]	30.7	36,975	100
British Columbia	4,705 [A]	61.6	2,930 [A]	38.4	7,640	100
Canada	**127,075** [A]	**74.5**	**43,575** [A]	**25.5**	**170,650**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Canadian producers were asked in this survey about their method of fertilizer application. "Broadcasting" accounted for about one-third of all commercial fertilizer application methods, while "applied with seed" constituted a further one-third of methods (Table 5). Broadcasting was a less popular practice in the Prairies, particularly in Saskatchewan, while "applied with seed" was more commonplace in the Prairies. "Knifing in" or "injecting" fertilizer into the ground formed only 8.5% of all commercial fertilizer application methods, and again this practice was more prevalent in the Prairies. "Banding" accounted for a little over 17% of all methods, while top- or side-dressing during the post planting period constituted just under 3% of all methods.

Table 5: Method of commercial fertilizer application, Canada and provinces, 2001

	Broadcasting	Banded	Applied with seed	Post-plant top/side dressing	Injected or knifed in	Other	Total
	Number of methods						
Newfoundland and Labrador	120 [C]	35 [B]	X	X	X	X	215
Prince Edward Island	635 [B]	340 [A]	485 [A]	60 [A]	X	X	1,550
Nova Scotia	1,320 [B]	205 [A]	240 [A]	140 [A]	35 [A]	100 [A]	2,030
New Brunswick	735 [B]	215 [A]	X	X	X	X	1,455
Quebec	11,755 [A]	3,970 [A]	7,135 [A]	1,240 [A]	1,585 [A]	320 [A]	26,010
Ontario	25,685 [A]	7,700 [A]	11,575 [A]	2,335 [A]	3,665 [A]	1,650 [A]	52,615
Manitoba	4,150 [A]	3,095 [A]	6,310 [A]	260 [A]	1,785 [A]	205 [A]	15,800
Saskatchewan	3,730 [A]	8,740 [A]	24,475 [A]	445 [A]	4,535 [A]	475 [A]	42,405
Alberta	9,495 [A]	6,310 [A]	14,290 [A]	330 [A]	3,515 [A]	555 [A]	34,490
British Columbia	3,205 [A]	610 [A]	530 [A]	380 [A]	270 [A]	705 [A]	5,690
Canada	**60,820** [A]	**31,235** [A]	**65,455** [A]	**5,265** [A]	**15,420** [A]	**4,060** [A]	**182,255**
	Share of methods (%)						
Newfoundland and Labrador	55.8	16.3	X	X	X	X	100
Prince Edward Island	41.0	22.0	31.3	3.9	X	X	100
Nova Scotia	65.0	10.1	11.8	6.9	1.7	4.9	100
New Brunswick	50.5	14.8	X	X	X	X	100
Quebec	45.2	15.3	27.4	4.8	6.1	1.2	100
Ontario	48.8	14.6	22.0	4.4	7.0	3.1	100
Manitoba	26.3	19.6	39.9	1.6	11.3	1.3	100
Saskatchewan	8.8	20.6	57.7	1.0	10.7	1.1	100
Alberta	27.5	18.3	41.4	1.0	10.2	1.6	100
British Columbia	56.3	10.7	9.3	6.7	4.7	12.4	100
Canada	**33.4**	**17.1**	**35.9**	**2.9**	**8.5**	**2.2**	**100**

Notes: *1.* An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

The FEMS did not ask farmers how much fertilizer they applied, since specific survey difficulties present themselves with this type of question. Farmers typically do not know, or are not able to answer how many tonnes of fertilizer they applied to their land, the specific form of the fertilizer, or the aggregate amount of nutrient applied. Fortunately, this information is gathered together by Agriculture and Agri-Food Canada, and is presented below in Tables 6 and 7.

Table 6: Sales of fertilizer, Atlantic Canada, Quebec, Ontario and Manitoba, July 2000 to June 2001

	Atlantic Canada	Quebec	Ontario	Manitoba
		Tonnes		
Nitrogen				
Urea	10,316	94,169	178,553	206,405
Ammonium sulphate	3,529	3,046	13,166	64,398
Ammonium nitrate	35,647	18,872	18,401	34,374
Anhydrous ammonia	0	4,891	22,885	165,178
Nitrogen solution	0	41,762	132,638	72,721
Calcium nitrate	0	0	2,128	0
Calcium ammonium nitrate	4,805	51,328	16,546	0
N nutrient tonnes	27,707	97,965	170,134	301,984
Phosphate				
Monoammonium phosphate	3,692	21,669	109,290	189,583
Ammonium polyphosphate	0	0	0	23,708
Diammonium phosphate	46,648	76,558	14,586	0
Single super phosphate	0	151	480	0
Triple super phosphate	973	3,763	3,623	0
P_2O_5 nutrient tonnes	23,626	48,204	75,943	106,923
Potash				
Muriate of potash	39,227	84,637	163,591	55,908
Potassium sulphate	0	1,646	7,482	0
Potassium magnesium sulphate	2,124	18,658	20,029	0
Potassium nitrate	0	0	633	0
K_2O nutrient tonnes	24,396	55,804	112,236	34,686
Mixed fertilizer materials	0	10,283	0	0
Other	1,318	6,590	49,471	24,776

Note: Due to rounding, figures may not add up to totals.
Source: Agriculture and Agri-Food Canada, 2001.

Table 7: Sales of fertilizer, Saskatchewan, Alberta, British Columbia and Canada, July 2000 to June 2001

	Saskatchewan	Alberta	British Columbia	Canada
	Tonnes			
Nitrogen				
Urea	536,585	459,138	35,027	**1,520,193**
Ammonium sulphate	143,101	130,903	8,132	**366,275**
Ammonium nitrate	38,081	73,977	5,079	**224,431**
Anhydrous ammonia	201,743	169,590	0	**564,287**
Nitrogen solution	92,121	22,767	3,837	**365,846**
Calcium nitrate	0	0	0	**2,128**
Calcium ammonium nitrate	0	0	0	**72,679**
N nutrient tonnes	531,064	442,936	25,307	**1,597,097**
Phosphate				
Monoammonium phosphate	390,457	287,590	14,987	**1,017,268**
Ammonium polyphosphate	35,199	14,083	92	**73,082**
Diammonium phosphate	0	0	0	**137,792**
Single super phosphate	0	0	0	**631**
Triple super phosphate	0	0	0	**8,359**
P_2O_5 nutrient tonnes	215,167	155,106	9,203	**634,372**
Potash				
Muriate of potash	49,481	85,244	9,520	**487,608**
Potassium sulphate	0	0	0	**9,128**
Potassium magnesium sulphate	0	0	0	**40,811**
Potassium nitrate	0	0	0	**633**
K_2O nutrient tonnes	30,317	52,117	6,979	**316,535**
Mixed fertilizer materials	0	0	0	**10,283**
Other	29,466	11,043	7,612	**130,276**

Note: Due to rounding, figures may not add up to totals.
Source: Agriculture and Agri-Food Canada, 2001.

Canadian farmers were asked in the FEMS on the time of year that they applied their fertilizer to the fields. Tables 8, 9 and 10 summarize the time of year that farmers apply most (greater than 75%) of their fertilizer. In 2001, much of the fertilizer applied in Canada was during the spring season, over 90% for the most part. The notable exceptions are anhydrous ammonia application in Central Canada and in the West, and urea application in Atlantic Canada. The balance of anhydrous ammonia was applied mainly in summer in Central Canada and in the fall in Western Canada. The balance of urea was mainly applied in the summer in Atlantic Canada.

Table 8: Season when farmers apply most (76% to 100%) of their fertilizer, Atlantic Canada, 2001

	Spring		Summer		Fall		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Nitrogen								
Anhydrous ammonia	X	X	X	X	0	0.0	X	X
Urea	145 [E]	61.7	90 [D]	38.3	0	0.0	235	100
Ammonium nitrate	580 [C]	77.1	165 [B]	21.9	X	X	750	100
Ammonium sulphate	120 [D]	100.0	0	0.0	0	0.0	120	100
Nitrogen solution	80 [E]	94.1	X	X	X	X	85	100
Calcium nitrate	45 [D]	81.8	X	X	X	X	55	100
Blend	2,190 [B]	98.9	25 [A]	1.1	0	0.0	2,215	100
Phosphate								
Monoammonium phosphate	F	F	X	X	0	0.0	55	100
Diammonium phosphate	220 [E]	100.0	0	0.0	0	0.0	220	100
Ammonium polyphosphate	F	F	X	X	0	0.0	40	100
Triple super phosphate	F	F	X	X	0	0.0	75	100
Single super phosphate	F	F	0	0.0	0	0.0	X	X
Blend	1,795 [C]	98.0	30 [A]	1.6	X	X	1,830	100

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 9: Season when farmers apply most (76% to 100%) of their fertilizer, Central Canada, 2001

	Spring		Summer		Fall		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Nitrogen								
Anhydrous ammonia	2,040 [C]	74.2	710 [B]	25.8	0	0.0	2,750	100
Urea	14,675 [B]	96.2	490 [A]	3.2	85 [A]	0.6	15,250	100
Ammonium nitrate	5,305 [B]	88.7	630 [A]	10.5	45 [A]	0.8	5,980	100
Ammonium sulphate	1,075 [D]	92.4	X	X	X	X	1,165	100
Nitrogen solution	4,705 [B]	83.9	X	X	X	X	5,605	100
Calcium nitrate	1,160 [D]	74.2	X	X	X	X	1,565	100
Blend	21,560 [A]	96.4	400 [A]	1.8	415 [A]	1.9	22,375	100
Phosphate								
Monoammonium phosphate	3,770 [C]	92.6	60 [A]	1.5	240 [A]	5.9	4,070	100
Diammonium phosphate	3,055 [C]	97.0	35 [A]	1.1	60 [A]	1.9	3,150	100
Ammonium polyphosphate	1,305 [D]	89.1	60 [A]	4.1	100 [A]	6.8	1,465	100
Triple super phosphate	1,660 [C]	80.4	145 [A]	7.0	260 [A]	12.6	2,065	100
Single super phosphate	640 [D]	74.9	70 [B]	8.2	145 [A]	17.0	855	100
Blend	23,105 [A]	94.8	490 [A]	2.0	770 [A]	3.2	24,365	100

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 10: Season when farmers apply most (76% to 100%) of their fertilizer, Western Canada, 2001

	Spring		Summer		Fall		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Nitrogen								
Anhydrous ammonia	12,075 [A]	69.9	35 [A]	0.2	5,155 [A]	29.9	17,265	100
Urea	15,680 [B]	90.4	320 [A]	1.8	1,350 [A]	7.8	17,350	100
Ammonium nitrate	5,310 [B]	89.7	215 [A]	3.6	395 [A]	6.7	5,920	100
Ammonium sulphate	4,000 [C]	91.7	45 [A]	1.0	315 [A]	7.2	4,360	100
Nitrogen solution	3,630 [C]	87.5	190 [A]	4.6	330 [A]	8.0	4,150	100
Calcium nitrate	270 [E]	76.9	X	X	X	X	350	100
Blend	29,455 [A]	95.3	305 [A]	1.0	1,160 [A]	3.8	30,920	100
Phosphate								
Monoammonium phosphate	24,895 [A]	98.3	70 [A]	0.3	365 [A]	1.4	25,330	100
Diammonium phosphate	515 [E]	94.5	X	X	X	X	545	100
Ammonium polyphosphate	1,915 [D]	92.7	X	X	X	X	2,065	100
Triple super phosphate	455 [E]	93.0	X	X	X	X	490	100
Single super phosphate	F	F	X	X	45 [C]	11.9	380	100
Blend	29,520 [A]	96.1	275 [A]	0.9	920 [A]	3.0	30,715	100

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

The FEMS indicates that soil testing was the most popular method of deciding on the amount and type of commercial fertilizer to apply in Canada as a whole, amounting to 48.0% of all methods (Table 11). In Quebec, soil testing accounted for almost three-quarters of all methods reported. In contrast, foliage testing formed only 2.8% of all methods in that province. This latter method constituted about 8% of all the methods reported in New Brunswick and British Columbia.

Across Canada, the use of economic factors such as the cost of fertilizer and/or crop prices accounted for 21.3% of all the methods farmers employed in deciding how much, and what kind of fertilizer to apply to their crops. This method appears to be particularly significant in the Prairie provinces. In Saskatchewan, it represented 31.0% of all the methods used, while in Manitoba and Alberta, the figures were 25.8% and 23.7%, respectively.

The third most important factor in deciding fertilizer application was moisture conditions. While this method of deciding constituted 15.8% of all methods in Canada, there was a higher proportion in Saskatchewan and Alberta. Moisture conditions were also reported as a significant factor in Nova Scotia.

There were other methods that Canadian farmers indicated they used when considering the amount and type of fertilizer to apply. Overall, these "other" methods accounted for a little over 12% of all methods reported. In certain provinces outside Quebec and the Prairies, the "other" factors were a significant consideration.

Table 11: Method of deciding amount and type of commercial fertilizer application, Canada and provinces, 2001

	Soil testing	Foliage testing	Cost of fertilizer/ crop prices	Moisture conditions	Other	Total
	Number of methods					
Newfoundland and Labrador	90 [C]	X	X	X	90 [C]	205
Prince Edward Island	740 [B]	X	210 [A]	X	190 [A]	1,325
Nova Scotia	800 [B]	X	X	290 [A]	530 [B]	2,005
New Brunswick	755 [B]	110 [A]	X	X	380 [B]	1,380
Quebec	14,915 [A]	1,080 [A]	1,475 [A]	515 [A]	2,060 [A]	20,050
Ontario	25,480 [A]	1,425 [A]	5,520 [A]	1,790 [A]	7,205 [A]	41,420
Manitoba	7,445 [A]	235 [A]	4,000 [A]	1,875 [A]	1,960 [A]	15,520
Saskatchewan	17,845 [A]	715 [A]	17,410 [A]	15,975 [A]	4,235 [A]	56,194
Alberta	17,290 [A]	825 [A]	9,325 [A]	7,805 [A]	4,155 [A]	39,405
British Columbia	2,785 [A]	515 [A]	795 [A]	500 [A]	1,660 [A]	6,260
Canada	**88,140** [A]	**5,070** [A]	**39,130** [A]	**28,955** [A]	**22,460** [A]	**183,765**
	Share of methods (%)					
Newfoundland and Labrador	43.9	X	X	X	43.9	100
Prince Edward Island	55.8	X	15.8	X	14.3	100
Nova Scotia	39.9	X	X	14.5	26.4	100
New Brunswick	54.7	8.0	X	X	27.5	100
Quebec	74.4	5.4	7.4	2.6	10.3	100
Ontario	61.5	3.4	13.3	4.3	17.4	100
Manitoba	48.0	1.5	25.8	12.1	12.6	100
Saskatchewan	31.8	1.3	31.0	28.4	7.5	100
Alberta	43.9	2.1	23.7	19.8	10.5	100
British Columbia	44.5	8.2	12.7	8.0	26.5	100
Canada	**48.0**	**2.8**	**21.3**	**15.8**	**12.2**	**100**

Notes: ***1.*** An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Producers were also asked how frequently they tested their soils for nutrients. About three quarters of the respondents indicated that they tested their soils to determine the levels of nutrient carry-over (Table 12). Most farms tested every two or three years, but less than 20% carried out soil testing on an annual basis.

Among the provinces, Quebec and Prince Edward Island tested their soil more frequently, while Nova Scotia and, to a lesser extent, British Columbia tended to test less frequently. About 40% of the farms in Central Canada test their soil every two to three years.

Table 12: Frequency of soil nutrient testing, Canada and provinces, 2001

	Every year	Every 2 to 3 years	Every 4 to 5 years	Every 5 years or more	Not tested	Total
	Number of farms					
Newfoundland and Labrador	55 [B]	65 [C]	35 [B]	X	X	240
Prince Edward Island	360 [B]	370 [B]	185 [A]	X	X	1,240
Nova Scotia	205 [A]	445 [B]	330 [B]	400 [B]	575 [B]	1,945
New Brunswick	360 [B]	350 [B]	260 [B]	330 [B]	295 [B]	1,585
Quebec	4,640 [A]	9,065 [A]	5,390 [A]	2,110 [A]	1,930 [A]	23,130
Ontario	5,585 [A]	15,810 [A]	6,365 [A]	5,185 [A]	8,290 [A]	41,235
Manitoba	3,565 [A]	3,690 [A]	1,255 [A]	1,855 [A]	3,475 [A]	13,850
Saskatchewan	7,350 [A]	10,215 [A]	4,280 [A]	5,655 [A]	14,640 [A]	42,135
Alberta	9,750 [A]	8,320 [A]	3,440 [A]	4,445 [A]	10,995 [A]	36,950
British Columbia	1,200 [A]	1,720 [A]	770 [A]	1,405 [A]	2,460 [A]	7,545
Canada	**33,075** [A]	**50,045** [A]	**22,290** [A]	**21,545** [A]	**42,905** [A]	**169,870**
	Share (%) of farms					
Newfoundland and Labrador	22.9	27.1	14.6	X	X	100
Prince Edward Island	29.0	29.8	14.9	X	X	100
Nova Scotia	10.5	22.9	17.0	20.6	29.6	100
New Brunswick	22.7	22.1	16.4	20.8	18.6	100
Quebec	20.1	39.2	23.3	9.1	8.3	100
Ontario	13.5	38.3	15.4	12.6	20.1	100
Manitoba	25.7	26.6	9.1	13.4	25.1	100
Saskatchewan	17.4	24.2	10.2	13.4	34.7	100
Alberta	26.4	22.5	9.3	12.0	29.8	100
British Columbia	15.9	22.8	10.2	18.6	32.6	100
Canada	**19.5**	**29.5**	**13.1**	**12.7**	**25.3**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 13 shows that 44.6% of Canadian crop growers reduced their application of nitrogen fertilizer following cultivation of a legume crop. The higher response rates were found in Quebec and Ontario at 65.9% and 61.2%, respectively.

Table 13: Reduction of nitrogen application to offset nutrient content of legumes, Canada and provinces, 2001

	Yes		No		Not applicable		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	60 [D]	35.3	25 [C]	14.7	90 [D]	52.9	170	100
Prince Edward Island	565 [B]	53.6	305 [B]	28.9	180 [B]	17.1	1,055	100
Nova Scotia	415 [B]	28.0	230 [B]	15.5	835 [B]	56.4	1,480	100
New Brunswick	540 [B]	50.9	300 [B]	28.3	225 [B]	21.2	1,060	100
Quebec	10,880 [A]	65.9	1,625 [A]	9.8	4,000 [A]	24.2	16,505	100
Ontario	20,585 [A]	61.2	4,965 [A]	14.8	8,095 [A]	24.1	33,650	100
Manitoba	3,695 [A]	34.4	2,245 [A]	20.9	4,785 [A]	44.6	10,730	100
Saskatchewan	9,220 [A]	28.9	8,455 [A]	26.5	14,220 [A]	44.6	31,900	100
Alberta	9,655 [A]	37.5	5,845 [A]	22.7	10,215 [A]	39.7	25,715	100
British Columbia	970 [A]	20.5	885 [A]	18.7	2,865 [A]	60.6	4,730	100
Canada	**56,590** [A]	**44.6**	**24,885** [A]	**19.6**	**45,510** [A]	**35.8**	**126,975**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

6. Commercial fertilizer and manure

Canadian farmers indicated that 39.2% of them apply fertilizer to land that has had manure applied to it (Table 14). The rates are much higher in Eastern Canada. It should be noted that 34.0% of the farm population stated that this question was not applicable to their situation, i.e. they did not have any livestock in their farming operation, had no opportunity to procure manure for this purpose, or had otherwise choosen not to apply manure to their land. This was particularly the situation in Saskatchewan, where the area of land relative to the livestock population is much greater.

Table 14: Application of commercial fertilizers to land with manure applied, Canada and provinces, 2001

	Yes		No		Not applicable		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	75 [D]	44.1	55 [D]	32.4	50 [C]	29.4	170	100
Prince Edward Island	695 [B]	65.9	270 [B]	25.6	95 [A]	9.0	1,055	100
Nova Scotia	785 [B]	53.4	280 [B]	19.0	405 [B]	27.6	1,470	100
New Brunswick	490 [B]	45.2	405 [B]	37.3	195 [A]	18.0	1,085	100
Quebec	8,590 [A]	51.9	5,115 [A]	30.9	2,840 [A]	17.2	16,545	100
Ontario	16,255 [A]	48.1	8,040 [A]	23.8	9,495 [A]	28.1	33,790	100
Manitoba	3,580 [A]	33.1	3,940 [A]	36.5	3,295 [A]	30.5	10,805	100
Saskatchewan	7,750 [A]	24.2	7,805 [A]	24.4	16,480 [A]	51.4	32,035	100
Alberta	10,220 [A]	39.6	6,950 [A]	26.9	8,640 [A]	33.5	25,810	100
British Columbia	1,545 [A]	32.5	1,340 [A]	28.2	1,870 [A]	39.3	4,755	100
Canada	**49,980** [A]	**39.2**	**34,200** [A]	**26.8**	**43,355** [A]	**34.0**	**127,525**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

When asked if they reduced fertilizer application to land which has had manure applied, 43.1% of Canadian farms responded that they did (Table 15). However, in all provinces in eastern Canada the response rate was much higher than the national average. In the western provinces, particularly Saskatchewan, relatively few farms reduced their fertilizer application to offset the nutrient content in manure.

Table 15: Reduction of commercial fertilizer to offset nutrient content of manure, Canada and provinces, 2001

	Yes		No		Not applicable		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	100 [D]	58.8	X	X	X	X	170	100
Prince Edward Island	760 [B]	72.0	X	X	X	X	1,055	100
Nova Scotia	805 [B]	55.7	185 [B]	12.8	455 [B]	31.5	1,445	100
New Brunswick	595 [C]	54.8	240 [B]	22.1	255 [B]	23.5	1,085	100
Quebec	11,970 [A]	72.3	785 [A]	4.7	3,785 [A]	22.9	16,545	100
Ontario	18,380 [A]	54.5	2,720 [A]	8.1	12,605 [A]	37.4	33,700	100
Manitoba	3,985 [A]	36.9	1,575 [A]	14.6	5,240 [A]	48.5	10,795	100
Saskatchewan	6,830 [A]	21.3	5,550 [A]	17.3	19,625 [A]	61.3	32,010	100
Alberta	9,985 [A]	38.7	3,970 [A]	15.4	11,870 [A]	46.0	25,825	100
British Columbia	1,510 [A]	31.9	750 [A]	15.8	2,480 [A]	52.3	4,740	100
Canada	**54,925** [A]	**43.1**	**15,915** [A]	**12.5**	**56,535** [A]	**44.4**	**127,390**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Canadian farmers generally appear to not test the nutrient content of manure (Table 16). The highest response rate was in Quebec, which was over three times the national average. This outcome is due to the provincial regulations that requires producers in the province to submit nutrient management plans.

Table 16: Testing nutrient content of manure before application, Canada and provinces, 2001

	Yes for liquid manure	Yes for solid/semi-solid manure	Manure not tested	No manure applied	Total
	Number of responses				
Newfoundland and Labrador	X	X	125 [C]	90 [C]	240
Prince Edward Island	X	X	970 [B]	230 [A]	1,240
Nova Scotia	45 [A]	45 [A]	1,105 [B]	750 [B]	1,955
New Brunswick	75 [A]	50 [A]	855 [B]	615 [B]	1,600
Quebec	3,835 [A]	4,250 [A]	11,860 [A]	4,585 [A]	24,535
Ontario	2,405 [A]	1,805 [A]	22,950 [A]	14,680 [A]	41,840
Manitoba	480 [A]	335 [A]	7,465 [A]	5,755 [A]	14,040
Saskatchewan	205 [A]	130 [A]	16,830 [A]	25,510 [A]	42,660
Alberta	285 [A]	585 [A]	20,820 [A]	15,600 [A]	37,295
British Columbia	110 [A]	240 [A]	3,425 [A]	3,925 [A]	7,700
Canada	**7,475** [A]	**7,490** [A]	**86,405** [A]	**71,730** [A]	**173,095**
	Share (%) of responses				
Newfoundland and Labrador	X	X	52.1	37.5	100
Prince Edward Island	X	X	78.2	18.5	100
Nova Scotia	2.3	2.3	56.5	38.4	100
New Brunswick	4.7	3.1	53.4	38.4	100
Quebec	15.6	17.3	48.3	18.7	100
Ontario	5.7	4.3	54.9	35.1	100
Manitoba	3.4	2.4	53.2	41.0	100
Saskatchewan	0.5	0.3	39.5	59.8	100
Alberta	0.8	1.6	55.8	41.8	100
British Columbia	1.4	3.1	44.5	51.0	100
Canada	**4.3**	**4.3**	**49.9**	**41.4**	**100**

Notes: *1.* An individual farm could report testing for both liquid and solid/semi-solid manure. Therefore, the totals do not refer to the number of farms.

2. Due to rounding, figures may not add up to totals.

Source: Statistics Canada, 2001 Farm Environmental Management Survey.

7. Nutrient management plans

Nutrient management plans (NMPs) are a relatively new concept that is being introduced in some parts of Canada. These are formal written plans prepared by a trained person or specialist, which consider issues such as the method and timing of nutrient application. Other considerations include the carry-over of nutrients and the distance to waterways.

According to Table 17, 47.0% of the farms in Quebec have a NMP. The percentage in other Canadian provinces are much lower. Amongst farms that do have a NMP, 91.7% reported that they implemented their plan (Table 18). With the exception of Quebec (95.5%) and Saskatchewan (83.9%), about 90% of the farmers in the other provinces have implemented their nutrient management plans.

Table 17: Nutrient management plans, Canada and provinces, 2001

	Yes		No		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	25 [A]	9.5	215 [B]	90.5	240	100
Prince Edward Island	110 [A]	8.9	1,130 [A]	91.1	1,240	100
Nova Scotia	100 [A]	5.2	1,845 [A]	94.8	1,945	100
New Brunswick	225 [A]	14.3	1,355 [B]	85.7	1,580	100
Quebec	10,925 [A]	47.0	12,340 [A]	53.0	23,265	100
Ontario	4,795 [A]	11.6	36,600 [A]	88.4	41,395	100
Manitoba	1,815 [A]	13.1	12,040 [A]	86.9	13,855	100
Saskatchewan	2,630 [A]	6.2	39,825 [A]	93.8	42,455	100
Alberta	3,865 [A]	10.5	33,085 [A]	89.5	36,950	100
British Columbia	820 [A]	10.8	6,780 [A]	89.2	7,600	100
Canada	**25,310** [A]	**14.8**	**145,215** [A]	**85.2**	**170,525**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 18: Full or partial implementation of nutrient management plan, Canada and provinces, 2001

	Yes		No		Don't know		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	F	F	X	X	0	0.0	X	X
Prince Edward Island	F	F	X	X	0	0.0	125	100
Nova Scotia	F	F	X	X	0	0.0	X	X
New Brunswick	X	X	X	X	0	0.0	270	100
Quebec	11,370 [B]	95.5	480 [A]	4.1	55 [A]	0.5	11,905	100
Ontario	5,245 [B]	90.0	410 [A]	7.0	175 [A]	3.0	5,830	100
Manitoba	1,985 [C]	90.8	165 [A]	7.5	35 [A]	1.6	2,185	100
Saskatchewan	3,520 [C]	83.9	600 [A]	14.3	80 [A]	1.9	4,200	100
Alberta	4,125 [C]	91.9	285 [A]	6.3	75 [A]	1.7	4,485	100
British Columbia	975 [D]	87.7	110 [B]	10.1	25 [A]	2.2	1,110	100
Canada	**27,725** [A]	**91.7**	**2,075** [A]	**6.9**	**445** [A]	**1.5**	**30,245**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Producers were asked the reason they had a NMP. Most responded that they had plans because of their concerns over the environment (43.6% of total responses) (Table 19). The second most common reason was that it was a part of the operation's manure management plan (34.4%). Government regulations constituted 22.0% of all the responses, with this reason accounting for 32.6% of all the responses in Quebec.

Table 19: Reason for nutrient management plan, Canada and provinces, 2001

	Government Regulations	Part of manure management plan	Concerns for the Environment	Total
	Number of responses			
Newfoundland and Labrador	0	F	F	X
Prince Edward Island	X	X	85 [E]	125
Nova Scotia	X	F	X	X
New Brunswick	40 [C]	130 [D]	125 [D]	295
Quebec	5,620 [A]	6,100 [A]	5,515 [A]	17,235
Ontario	820 [A]	1,895 [B]	2,985 [B]	5,700
Manitoba	200 [B]	515 [B]	1,095 [C]	1,810
Saskatchewan	75 [A]	535 [B]	1,285 [C]	1,895
Alberta	175 [A]	1,500 [B]	2,315 [B]	3,990
British Columbia	105 [B]	235 [C]	475 [C]	815
Canada	**7,035** [A]	**11,000** [A]	**13,935** [A]	**31,970**
	Share (%) of responses			
Newfoundland and Labrador	0.0	F	F	X
Prince Edward Island	X	X	68.0	100
Nova Scotia	X	F	X	X
New Brunswick	13.1	44.1	42.4	100
Quebec	32.6	35.4	32.0	100
Ontario	14.4	33.2	52.4	100
Manitoba	11.0	28.3	60.6	100
Saskatchewan	4.1	28.2	67.8	100
Alberta	4.4	37.6	58.1	100
British Columbia	12.6	29.1	58.3	100
Canada	**22.0**	**34.4**	**43.6**	**100**

Notes: *1.* An individual farm could report more than one reason. Therefore, the totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

8. Pesticide management

The survey asked farmers if they applied any pesticides (herbicides, insecticides, fungicides) to their crops in 2001 and 73.2% answered in the affirmative (Table 20). The largest percentage of farmers who applied pesticides are found in Saskatchewan at 82.8%. This is followed by 80.2% in Prince Edward Island, and 79.2% in Ontario. In British Columbia and Nova Scotia, only about 48% of farms applied pesticides on their crops.

Table 20: Application of herbicides, insecticides and fungicides, Canada and provinces, 2001

	Yes		No		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	135 [D]	56.2	105 [D]	43.8	240	100
Prince Edward Island	990 [B]	80.2	245 [B]	19.8	1,235	100
Nova Scotia	940 [B]	48.4	1,005 [B]	51.6	1,945	100
New Brunswick	855 [B]	54.1	725 [B]	45.9	1,580	100
Quebec	15,795 [A]	68.1	7,405 [A]	31.9	23,200	100
Ontario	32,760 [A]	79.2	8,580 [A]	20.8	41,340	100
Manitoba	10,620 [A]	76.9	3,185 [A]	23.1	13,805	100
Saskatchewan	35,015 [A]	82.8	7,260 [A]	17.2	42,275	100
Alberta	23,875 [A]	64.6	13,110 [A]	35.4	36,985	100
British Columbia	3,655 [A]	47.9	3,985 [A]	52.1	7,640	100
Canada	**124,640** [A]	**73.2**	**45,605** [A]	**26.8**	**170,245**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

The FEMS also asked farmers which criteria or rule they use in deciding when to apply pesticides. Half of the farms in Canada decided to apply *herbicides* based on the growth stage of their crop (Table 21). Similar percentages were found in all provinces except Newfoundland and Labrador and British Columbia, which were much lower. The second most frequent reason was based on the first sight of pests (18.6%), followed by regional monitoring of pests (15.1%). The former method was popular in Newfoundland and Labrador and British Columbia.

With respect to *insecticides*, 40.9% of the farmers who applied them decided to do so when they felt that the level of pests or insects exceeded acceptable levels (Table 22). While there was considerable variation across Canada, this was a particularly popular method in the Prairie provinces. Another 28.1% of farmers applied insecticides at the first sign of pests.

When it comes to *fungicide* application, there did not appear to be a dominant factor that farmers used in determining when to apply them (Table 23).

Table 21: Reasons for deciding to apply herbicides, Canada and provinces, 2001

	Based on calendar dates	At the first sign of pests	Based on crop growth stage	Based on regional monitoring of pests	When pests on farm exceed acceptable levels	Total
	Number of farms					
Newfoundland and Labrador	30 [D]	60 [D]	25 [C]	X	X	125
Prince Edward Island	55 [A]	150 [A]	595 [B]	100 [A]	80 [A]	980
Nova Scotia	170 [B]	120 [B]	450 [C]	X	X	875
New Brunswick	70 [A]	145 [B]	425 [C]	130 [B]	110 [B]	880
Quebec	1,000 [A]	4,515 [A]	6,725 [A]	1,960 [A]	2,220 [A]	16,425
Ontario	3,300 [A]	5,420 [A]	16,530 [A]	4,800 [A]	2,775 [A]	32,825
Manitoba	140 [A]	1,735 [A]	5,285 [A]	2,675 [A]	1,105 [A]	10,945
Saskatchewan	1,210 [A]	6,800 [A]	19,255 [A]	5,640 [A]	4,110 [A]	37,015
Alberta	860 [A]	3,925 [A]	14,155 [A]	3,615 [A]	2,620 [A]	25,185
British Columbia	345 [A]	965 [A]	960 [B]	435 [A]	570 [A]	3,280
Canada	**7,170** [A]	**23,845** [A]	**64,415** [A]	**19,460** [A]	**13,650** [A]	**128,525**
	Share (%) of farms					
Newfoundland and Labrador	24.0	48.0	20.0	X	X	100
Prince Edward Island	5.6	15.3	60.7	10.2	8.2	100
Nova Scotia	19.4	13.7	51.4	X	X	100
New Brunswick	8.0	16.5	48.3	14.8	12.5	100
Quebec	6.1	27.5	40.9	11.9	13.5	100
Ontario	10.1	16.5	50.4	14.6	8.5	100
Manitoba	1.3	15.9	48.3	24.4	10.1	100
Saskatchewan	3.3	18.4	52.0	15.2	11.1	100
Alberta	3.4	15.6	56.2	14.4	10.4	100
British Columbia	10.5	29.4	29.3	13.3	17.4	100
Canada	**5.6**	**18.6**	**50.1**	**15.1**	**10.6**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 22: Reasons for deciding to apply insecticides, Canada and provinces, 2001

	Based on calendar dates	At the first sign of pests	Based on crop growth stage	Based on regional monitoring of pests	When pests on farm exceed acceptable levels	Total
	Number of farms					
Newfoundland and Labrador	X	85 [D]	X	X	X	120
Prince Edward Island	X	195 [B]	90 [B]	X	170 [B]	565
Nova Scotia	35 [B]	220 [D]	X	X	X	520
New Brunswick	25 [A]	185 [B]	95 [B]	110 [B]	245 [C]	655
Quebec	245 [A]	1,525 [B]	475 [A]	1,040 [B]	1,020 [B]	4,305
Ontario	1,215 [A]	2,915 [A]	2,160 [A]	1,750 [A]	3,350 [A]	11,385
Manitoba	125 [A]	1,275 [B]	490 [A]	755 [A]	1,985 [B]	4,635
Saskatchewan	290 [A]	3,560 [A]	695 [A]	1,540 [A]	6,890 [A]	12,970
Alberta	120 [A]	1,775 [A]	540 [A]	880 [A]	3,635 [B]	6,950
British Columbia	175 [A]	700 [B]	265 [A]	285 [B]	670 [B]	2,095
Canada	**2,265** [A]	**12,435** [A]	**4,890** [A]	**6,535** [A]	**18,070** [A]	**44,200**
	Share (%) of farms					
Newfoundland and Labrador	X	70.8	X	X	X	100
Prince Edward Island	X	34.5	15.9	X	30.1	100
Nova Scotia	6.7	42.3	X	X	X	100
New Brunswick	3.8	28.2	14.5	16.8	37.4	100
Quebec	5.7	35.4	11.0	24.2	23.7	100
Ontario	10.7	25.6	19.0	15.4	29.4	100
Manitoba	2.7	27.5	10.6	16.3	42.8	100
Saskatchewan	2.2	27.4	5.4	11.9	53.1	100
Alberta	1.7	25.5	7.8	12.7	52.3	100
British Columbia	8.4	33.4	12.6	13.6	32.0	100
Canada	**5.1**	**28.1**	**11.1**	**14.8**	**40.9**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 23: Reasons for deciding to apply fungicides, Canada and provinces, 2001

	Based on calendar dates	At the first sign of pests	Based on crop growth stage	Based on regional monitoring of pests	When pests on farm exceed acceptable levels	Total
			Number of farms			
Newfoundland and Labrador	X	60 [E]	X	X	X	85
Prince Edward Island	140 [C]	70 [B]	120 [C]	80 [B]	25 [A]	440
Nova Scotia	X	40 [C]	X	X	X	325
New Brunswick	95 [B]	55 [B]	170 [C]	115 [C]	55 [B]	490
Quebec	285 [A]	900 [B]	605 [B]	635 [B]	520 [B]	2,945
Ontario	1,070 [A]	1,225 [A]	2,055 [A]	1,480 [A]	1,825 [A]	7,660
Manitoba	200 [A]	650 [A]	1,580 [B]	1,260 [B]	755 [A]	4,445
Saskatchewan	800 [A]	2,370 [A]	1,225 [A]	1,730 [A]	2,815 [A]	8,935
Alberta	260 [A]	630 [A]	1,035 [B]	915 [B]	1,285 [B]	4,120
British Columbia	285 [B]	490 [B]	485 [B]	265 [A]	360 [B]	1,885
Canada	**3,175** [A]	**6,475** [A]	**7,350** [A]	**6,650** [A]	**7,680** [A]	**31,320**
			Share (%) of farms			
Newfoundland and Labrador	X	70.6	X	X	X	100
Prince Edward Island	31.8	15.9	27.3	18.2	5.7	100
Nova Scotia	X	12.3	X	X	X	100
New Brunswick	19.4	11.2	34.7	23.5	11.2	100
Quebec	9.7	30.6	20.5	21.6	17.7	100
Ontario	14.0	16.0	26.8	19.3	23.8	100
Manitoba	4.5	14.6	35.5	28.3	17.0	100
Saskatchewan	9.0	26.5	13.7	19.4	31.5	100
Alberta	6.3	15.3	25.1	22.2	31.2	100
British Columbia	15.1	26.0	25.7	14.1	19.1	100
Canada	**10.1**	**20.7**	**23.5**	**21.2**	**24.5**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Farmers were asked if they used band application of pesticides on row crops. Less pesticide is generally required using this methodology. Just under 10% of the farmers indicated that they used this method (Table 24). The largest use is found in Newfoundland and Labrador. A significant percentage of farmers used this method in the regions outside of the Prairies.

Table 24: Farms using band application on row crops to reduce the amount of pesticides used, Canada and provinces, 2001

	Yes		No/not applicable		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	55 [D]	42.3	70 [D]	53.8	130	100
Prince Edward Island	245 [B]	25.4	715 [B]	74.1	965	100
Nova Scotia	135 [B]	14.4	805 [C]	85.6	940	100
New Brunswick	215 [B]	25.4	625 [C]	74.0	845	100
Quebec	3,235 [A]	20.7	12,385 [A]	79.3	15,625	100
Ontario	4,930 [A]	15.2	27,425 [A]	84.8	32,350	100
Manitoba	895 [A]	8.5	9,640 [B]	91.5	10,540	100
Saskatchewan	530 [A]	1.5	33,730 [A]	98.5	34,260	100
Alberta	1,240 [A]	5.3	22,205 [A]	94.7	23,450	100
British Columbia	615 [A]	17.5	2,900 [B]	82.4	3,520	100
Canada	**12,105** [A]	**9.9**	**110,505** [A]	**90.1**	**122,615**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Given the nature of pesticides and the importance of proper handling and application, the FEMS asked producers if a formally certified person applied pesticides on their farm. Nationally, just over 60% of the farmers responded that this was the case (Table 25). In Ontario, Prince Edward Island, and New Brunswick, the percentage of certified applicators was well over 90%.

Table 25: Farms using a formally certified person to apply pesticides, Canada and provinces, 2001

	Yes		No		Total	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Newfoundland and Labrador	X	X	X	X	135	100
Prince Edward Island	950 [B]	95.0	45 [A]	4.5	1,000	100
Nova Scotia	X	X	X	X	930	100
New Brunswick	795 [C]	93.0	60 [A]	7.0	855	100
Quebec	9,780 [A]	62.0	5,985 [A]	38.0	15,765	100
Ontario	30,785 [A]	93.4	2,180 [A]	6.6	32,970	100
Manitoba	5,660 [A]	54.1	4,805 [A]	45.9	10,460	100
Saskatchewan	12,350 [A]	35.6	22,370 [A]	64.4	34,715	100
Alberta	11,315 [A]	48.1	12,210 [A]	51.9	23,525	100
British Columbia	2,365 [B]	65.0	1,270 [B]	34.9	3,640	100
Canada	74,960 [A]	60.5	49,025 [A]	39.5	123,990	100

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

The FEMS asked producers when they calibrated their sprayer. This activity ensures that the application of the pesticide is accurate. Almost a half of the farmers in Canada calibrate their sprayers at the start of each season (Table 26). This is followed by just under 14% who calibrate the sprayer between applications of different pesticides. The latter is considered a beneficial management practice.

Table 26: Sprayer calibration, Canada and provinces, 2001

	Upon breakage or major component replacement	Before beginning of each crop season	Between applications of different types of pesticide	Other	Never	Not applicable	Total
	Number of farms						
Newfoundland and Labrador	X	55 [D]	50 [D]	X	X	25 [C]	135
Prince Edward Island	60 [A]	600 [B]	80 [A]	50 [A]	80 [A]	140 [A]	1,000
Nova Scotia	X	505 [C]	125 [B]	X	X	245 [B]	930
New Brunswick	35 [A]	445 [C]	95 [B]	55 [A]	30 [A]	190 [B]	855
Quebec	1,390 [A]	7,765 [A]	1,240 [A]	1,870 [A]	410 [A]	3,075 [A]	15,755
Ontario	680 [A]	14,890 [A]	3,945 [A]	2,000 [A]	595 [A]	10,705 [A]	32,815
Manitoba	315 [A]	5,700 [A]	1,365 [A]	725 [A]	425 [A]	2,085 [A]	10,625
Saskatchewan	1,215 [A]	18,890 [A]	6,295 [A]	1,750 [A]	1,940 [A]	4,825 [A]	34,920
Alberta	895 [A]	10,990 [A]	3,205 [A]	1,160 [A]	1,425 [A]	6,175 [A]	23,850
British Columbia	170 [A]	1,430 [B]	560 [A]	330 [A]	155 [A]	1,010 [A]	3,645
Canada	**4,820** [A]	**61,255** [A]	**16,950** [A]	**7,935** [A]	**5,085** [A]	**28,475** [A]	**124,525**
	Share (%) of farms						
Newfoundland and Labrador	X	40.7	37.0	X	X	18.5	100
Prince Edward Island	6.0	60.0	8.0	5.0	8.0	14.0	100
Nova Scotia	X	54.3	13.4	X	X	26.3	100
New Brunswick	4.1	52.0	11.1	6.4	3.5	22.2	100
Quebec	8.8	49.3	7.9	11.9	2.6	19.5	100
Ontario	2.1	45.4	12.0	6.1	1.8	32.6	100
Manitoba	3.0	53.6	12.8	6.8	4.0	19.6	100
Saskatchewan	3.5	54.1	18.0	5.0	5.6	13.8	100
Alberta	3.8	46.1	13.4	4.9	6.0	25.9	100
British Columbia	4.7	39.2	15.4	9.1	4.3	27.7	100
Canada	**3.9**	**49.2**	**13.6**	**6.4**	**4.1**	**22.9**	**100**

Note: Due to rounding, figures may not add up to totals.
Source: Statistics Canada, 2001 Farm Environmental Management Survey.

9. Alternative methods of pest control

There are many methods of pest control that do not involve the use of pesticides. Because this survey asked farmers to report all of the non-pesticide control methods they used, and the fact that there are many methods available, the total exceeds the number of farmers who reported growing crops. While most of these methods have been commonplace for many years (i.e. tillage), some are more recent innovations (for example, Bacillus thuringiensis). New interest in organic production methods is resulting in the adoption of more alternate pest control methods.

Various methods of weeding (mechanical and hand) account for over 59% of all alternative methods of pest control across Canada (Table 27). Saskatchewan is the province reporting the highest percentage of methods that utilize this form of weed control, at almost 70% (Table 29). The province with the lowest proportion reporting weeding as a pest control method is Nova Scotia at 41.5%.

There are various methods of controlling pests that employ the use of plants or crops. These include fall seeding, using tolerant or resistant plants, green manuring and others. These methods constituted 19.4% of all alternative methods of weed or insect control across Canada. The proportion in each province is very similar to the national average, although somewhat lower in Saskatchewan and British Columbia.

There are a series of pest control methods that can best be described as biological methods, since they consist of biological agents such as predators, parasites, and others. These biological methods form only 3.8% of all these alternative methods of pest control. The highest percentage is found in British Columbia, at 13.2%. The proportion in Ontario is less than one half of this percentage (Table 28).

Table 27: Alternative methods of pest control, Canada, Newfoundland and Labrador, Prince Edward Island and Nova Scotia, 2001

Methods used to control weeds, insects or diseases	Canada		Newfoundland and Labrador		Prince Edward Island		Nova Scotia	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Tolerant or resistant plants	12,305 [A]	5.5	X	X	55 [A]	2.7	150 [A]	5.7
Intercropping	5,120 [A]	2.3	35 [A]	7.7	30 [A]	1.4	80 [A]	3.0
Green manure	7,495 [A]	3.4	35 [A]	7.7	95 [A]	4.6	100 [A]	3.8
Cover cropping	11,940 [A]	5.4	25 [A]	5.5	125 [A]	6.0	220 [A]	8.3
Fall seeding	6,300 [A]	2.8	X	X	80 [A]	3.9	155 [A]	5.9
Mechanical weeding with rotary hoe	7,670 [A]	3.4	30 [A]	6.6	65 [A]	3.1	70 [A]	2.7
Tillage	72,065 [A]	32.4	80 [B]	17.7	495 [A]	23.9	420 [A]	15.9
Mechanical weeding with cultivator	34,185 [A]	15.4	60 [B]	13.2	310 [A]	15.0	140 [A]	5.3
Hand weeding	17,330 [A]	7.8	95 [B]	21.0	110 [A]	5.3	465 [A]	17.6
Predators	2,000 [A]	0.9	0	0.0	25 [A]	1.2	115 [A]	4.4
Parasites	715 [A]	0.3	X	X	X	X	35 [A]	1.3
Parasitoids	185 [A]	0.1	0	0.0	X	X	X	X
Pheromones	800 [A]	0.4	0	0.0	X	X	60 [A]	2.3
Pathogen agents	250 [A]	0.1	0	0.0	0	0.0	X	X
Bacillus thuringiensis	4,355 [A]	2.0	0	0.0	X	X	60 [A]	2.3
Ground cover	5,910 [A]	2.7	X	X	40 [A]	1.9	140 [A]	5.3
Floating covers	595 [A]	0.3	X	X	0	0.0	25 [A]	0.9
Mulching	5,115 [A]	2.3	25 [A]	5.5	65 [A]	3.1	140 [A]	5.3
Pit traps	295 [A]	0.1	X	X	0	0.0	X	X
Other methods	27,760 [A]	12.5	X	X	520 [A]	25.1	185 [A]	7.0
Total methods	**222,395**	**100**	**455**	**100**	**2,070**	**100**	**2,635**	**100**

Notes: *1.* An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.

Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 28: Alternative methods of pest control, New Brunswick, Quebec, Ontario and Manitoba, 2001

Methods used to control weeds, insects or diseases	New Brunswick		Quebec		Ontario		Manitoba	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Tolerant or resistant plants	40 [A]	1.5	980 [A]	3.9	3,835 [A]	5.6	1,190 [A]	7.1
Intercropping	30 [A]	1.1	440 [A]	1.7	1,615 [A]	2.3	485 [A]	2.9
Green manure	95 [A]	3.5	2,165 [A]	8.5	2,625 [A]	3.8	310 [A]	1.9
Cover cropping	155 [A]	5.7	980 [A]	3.9	5,325 [A]	7.7	690 [A]	4.1
Fall seeding	110 [A]	4.1	365 [A]	1.4	2,320 [A]	3.4	1,005 [A]	6.0
Mechanical weeding with rotary hoe	100 [A]	3.7	1,830 [A]	7.2	3,695 [A]	5.4	175 [A]	1.0
Tillage	550 [A]	20.3	6,860 [A]	27.0	15,825 [A]	23.0	7,340 [A]	43.8
Mechanical weeding with cultivator	290 [A]	10.7	4,780 [A]	18.8	9,855 [A]	14.3	2,380 [A]	14.2
Hand weeding	185 [A]	6.8	1,610 [A]	6.3	8,485 [A]	12.3	500 [A]	3.0
Predators	X	X	200 [A]	0.8	615 [A]	0.9	75 [A]	0.4
Parasites	0	0.0	X	X	340 [A]	0.5	35 [A]	0.2
Parasitoids	0	0.0	X	X	30 [A]	0.0	0	0.0
Pheromones	X	X	30 [A]	0.1	135 [A]	0.2	0	0.0
Pathogen agents	0	0.0	0	0.0	120 [A]	0.2	X	X
Bacillus thuringiensis	X	X	915 [A]	3.6	2,815 [A]	4.1	80 [A]	0.5
Ground cover	60 [A]	2.2	265 [A]	1.0	2,355 [A]	3.4	310 [A]	1.9
Floating covers	40 [A]	1.5	35 [A]	0.1	200 [A]	0.3	0	0.0
Mulching	65 [A]	2.4	390 [A]	1.5	1,825 [A]	2.7	405 [A]	2.4
Pit traps	X	X	45 [A]	0.2	55 [A]	0.1	X	X
Other methods	945 [B]	34.9	3,440 [A]	13.6	6,700 [A]	9.7	1,755 [A]	10.5
Total methods	**2,710**	**100**	**25,380**	**100**	**68,770**	**100**	**16,740**	**100**

Notes: *1.* An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.

Source: Statistics Canada, 2001 Farm Environmental Management Survey.

Table 29: Alternative methods of pest control, Saskatchewan, Alberta and British Columbia, 2001

Methods used to control weeds, insects or diseases	Saskatchewan		Alberta		British Columbia	
	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)	Number of farms	Share of farms (%)
Tolerant or resistant plants	3,660 [A]	7.3	2,160 [A]	5.3	245 [A]	2.0
Intercropping	920 [A]	1.8	1,285 [A]	3.1	200 [A]	1.6
Green manure	905 [A]	1.8	775 [A]	1.9	385 [A]	3.1
Cover cropping	1,275 [A]	2.5	2,390 [A]	5.9	755 [A]	6.1
Fall seeding	1,150 [A]	2.3	740 [A]	1.8	355 [A]	2.9
Mechanical weeding with rotary hoe	405 [A]	0.8	755 [A]	1.9	550 [A]	4.4
Tillage	23,515 [A]	46.6	15,040 [A]	36.9	1,945 [A]	15.7
Mechanical weeding with cultivator	9,950 [A]	19.7	5,350 [A]	13.1	1,070 [A]	8.6
Hand weeding	1,345 [A]	2.7	2,265 [A]	5.6	2,280 [A]	18.4
Predators	150 [A]	0.3	260 [A]	0.6	550 [A]	4.4
Parasites	45 [A]	0.1	X	X	180 [A]	1.5
Parasitoids	0	0.0	70 [A]	0.2	30 [A]	0.2
Pheromones	X	X	40 [A]	0.1	475 [A]	3.8
Pathogen agents	X	X	X	X	50 [A]	0.4
Bacillus thuringiensis	0	0.0	95 [A]	0.2	365 [A]	2.9
Ground cover	1,100 [A]	2.2	1,035 [A]	2.5	590 [A]	4.8
Floating covers	X	X	125 [A]	0.3	160 [A]	1.3
Mulching	395 [A]	0.8	835 [A]	2.0	955 [A]	7.7
Pit traps	X	X	50 [A]	0.1	85 [A]	0.7
Other methods	5,535 [A]	11.0	7,470 [A]	18.3	1,195 [A]	9.6
Total methods	**50,455**	**100**	**40,795**	**100**	**12,405**	**100**

Notes: *1.* An individual farm could report more than one method. Therefore, totals do not refer to the number of farms.
2. Due to rounding, figures may not add up to totals.

Source: Statistics Canada, 2001 Farm Environmental Management Survey.

10. Summary

The FEMS provides key insights into the management practices that Canadian farmers employ with respect to fertilizers and pesticides, and some of the reasons for those decisions. While the survey gathered much data, not all the information is presented in this publication. This report has tried to present a summary description of every question asked in the fertilizer and pesticide module, one that would be of interest to the widest audience possible. Some information was added from other sources to provide the reader with more context.

A summary of the findings are presented below:

- About an equal number (40%) report "chop and spread" and "baling" as a method for managing crop residue.
- Fertilizer application methods vary across Canada. Broadcasting was the most commonly reported method outside the Prairie provinces, while "applied with seed" was the most reported method in the Prairies.
- Roughly 90% of the fertilizer is applied in the spring.
- On the decision on how much fertilizer to apply, soil testing made up 48% of the methods reported; few tested every year.
- Just under half of Canadian farmers reported reducing their fertilizer application following cultivation of a legume crop; a similar number did so on land that had manure applied to it.
- Few farms in Canada have nutrient management plans. Concerns for the environment is the single largest reason for having a nutrient plan.
- About three-quarters of Canadian farmers report applying pesticides. The criteria used in deciding when to apply varies greatly across the country.
- About 60% of the farmers that use pesticides have them applied by a formally trained person.
- With respect to controlling pests without the use of pesticides, about two-thirds of the methods reported were various forms of weeding. The next largest alternate methods consisted of using plants and crops to control pests (19.4%), while biological methods were at 3.8%.